REMARKS

Claims 13, 14, 16-17, and 41-43 are pending in the present application. Claims 13 and 41-43 have been amended. A marked-up version of this claim, showing changes made, is attached hereto as Appendix A. Applicants respectfully request reconsideration of all rejections in light of the following amendment and remarks.

In the present Amendment, claims 13 and 41-43 have been amended to recite in pertinent part "subjecting the dielectric film to a wet oxidation with steam process to raise the oxygen content of said dielectric film . . . in a rapid thermal process chamber . . . wherein the pressure of said rapid thermal process chamber is less than atmospheric pressure." Support for this recitation is found in Applicants' specification at page 6, line 31 and page 9, lines 2-5.

Claims 13, 14, 17, 42 and 43 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Miner. Reconsideration is respectfully requested.

Miner teaches a method "particularly suitable for the reoxidation of a semiconductor substrate having a <u>nitrogen-containing material</u> or <u>nitride</u> film on a surface." (Col. 4, lines 27-30) (emphasis added). Further, "[r]exoidation process 115 form an oxide (SiO_2) at the interface. In other words, SiO_2 is formed at the boundary between Si_3N_4 or $Si_xN_yO_z$ film 110 and substrate 100 to form a SiO_2/Si interface." (Col. 4, lines 49-53). The "presence of nitrogen in Si_3N_4 or $Si_xN_yO_z$ film 110, illustratively shown here overlying oxide layer 120, acts as an effective barrier layer to prevent the migration of dopants, such as boron, through oxide layer 120." (Col. 4, lines 56-58).

In contrast, Applicants recite "subjecting the dielectric film to a wet oxidation with steam process to <u>raise the oxygen content</u> of said dielectric film," in claims 13 and 41-43. The claims do not recite forming a SiO_2 layer at the interface, e.g., the boundary between the dielectric film and the substrate. Applicants' method allows a thicker gate insulating layer to be employed negating the necessity of forming Miner's SiO_2 layer. Moreover, by utilizing Applicants' methods, e.g., increasing the oxygen content of the

dielectric film, Applicants' oxide layer has improved leakage current properties. Miner does not teach increasing the oxygen content of the dielectric film which is the primary problem Applicants' method is directed to.

Accordingly, Miner fails to teach "subjecting the dielectric film to a wet oxidation with steam process to raise the oxygen content of said dielectric film . . . in a rapid thermal process chamber . . . wherein the pressure of said rapid thermal process chamber is less than atmospheric pressure," as recited in claims 13 and 41-43. Withdrawal of the rejection is solicited.

Claims 13, 14, 16-17, and 41-43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Luan in view of Tseng. Reconsideration is respectfully requested.

Claims 13 and 42 recite a method of fabricating a semiconductor device with "a mixture of hydrogen and oxygen gases . . . said mixture is a ratio from approximately 0.1 to approximately 0.80 of hydrogen gas to oxygen gas." Tseng simply does not teach this ratio.

In support of the rejection, the Office Action contends that "it would be a matter of routine optimization to determine the optimum ratio of hydrogen to oxygen." (Office Action, pg. 4). The Office Action further asserts that "[i]t would have been obvious to one of ordinary skill . . . to modify the method of Luan to use the temperature and ratio of hydrogen to oxygen taught by Tseng." (Office Action, pg. 4).

Applicants respectfully submit that Tseng teaches a specific percentage of hydrogen to oxygen and as a result, there would be no motivation to deviate from Tseng's values. Tseng teaches that "[t]he percentage of H_2 in the O_2 and H_2 mixture [is] approximately 6%, however a range of approximately 3% to 9% is expected to obtain comprable [sic] results." (Col. 6, lines 60-62). The ratio of Tseng's H_2:O_2 gas mixture is 0.03 to 0.09. There is no teaching or suggestion in Luan of a "ratio of H_2 to O_2 of about 0.1 to 0.8 (i.e. 10% to 80% H_2)", as acknowledged in the Office Action (pg. 3). As a result, there is no motivation in Luan to deviate from Tseng's teachings.

Moreover, it is not a matter of routine optimization to determine the optimum ratio of hydrogen to oxygen. Tseng claims a preferred ratio of H_2:O_2 gas; 0.06. In fact, Tseng teaches that the uppermost range for a H_2:O_2 gas mixture is 0.09, e.g., 9%. Tseng teaches a specific amount of hydrogen gas in combination with oxygen gas. There is no teaching or suggestion to deviate from Tseng's percentage of hydrogen gas. Accordingly, the combination of the cited references would expressly teach not going above 0.09, e.g., 9% for a H_2:O_2 gas ratio. This is below Applicants' claimed ranges, 0.1 to 0.8.

Still further, the combination of cited references do not teach or suggest, "subjecting the dielectric film to a wet oxidation with steam process to raise the oxygen content of said dielectric film . . . in a rapid thermal process chamber . . . wherein the pressure of said rapid thermal process chamber is less than atmospheric pressure," as recited in claims 13 and 41-43 (emphasis added).

Claims 14 and 16-17 depend from and contain all of the limitations of independent claim 13. For at least these reasons, claims 14 and 16-17 are allowable along with claim 13. Accordingly, withdrawal of the rejection for claims 13, 14, 16-17, and 41-43 is solicited.

Claim 14 further recites that the "wet oxidation is performed at a temperature in a range of about 750°C to about 950°C." Luan illustrates in FIGS. 2, 4, and 6, a Ta_2O_5/Al gate. Tseng discloses that it is not possible to perform an oxidation step to cure plasma etch damage when a metal gate is employed, which is specifically taught in Luan. Luan teaches employing an aluminum gate. Tseng teaches that "[a]t temperatures higher than 520°C . . . aluminum gates would be destroyed, degraded, severely oxidized ." (Col. 3, lines 1-8). Thus, the asserted combination of Luan and Tseng, if proper, would completely contradict each other since Luan teaches an anneal temperature of 600°C.

In contrast, Tseng teaches thermal constraints with the use of an aluminum gate, e.g., temperatures of above 520°C would not be employed since Luan's aluminum gate would be destroyed. Thus, even if the references are combinable, one skilled in the art would not perform a wet oxidation higher than 600°C since Tseng teaches that higher temperatures, e.g., above 520°C, degrade metal gates. Accordingly, the cited references would not suggest a wet oxidation anneal in a temperature range of "750°C to about 950°C." This is an additional reason for the allowance of claim 14.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

By

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